What is claimed is:

1. A channel equalizer for restoring an original signal from a digital television received signal that past through a channel, the channel equalizer comprising:

a channel estimator for estimating an impulse response of a transmission channel from a received signal having past through the transmission channel;

a channel distortion compensator for converting the received signal and the estimated impulse response of the transmission channel into frequency domain signals, setting a reciprocal of the estimated impulse response of the transmission channel in a frequency domain as an initial coefficient, receiving a channel equalized signal fed back in a data duration, calculating the error between equalized signal and decision value of the same equalized signal, updating the coefficients by using the error between equalized signal and decision value of the same equalized signal continuously, compensating distortion of the received signal converted into the frequency domain, and converting the compensated received signal back into a time domain; and

a noise canceller for predicting a noise from an output of the channel distortion compensator, the noise being amplified when equalized, and eliminating the amplified noise contained in the time domain signal outputted from the channel distortion compensator.

2. The channel equalizer of claim 1, wherein the channel estimator detects a training period, calculates a cross-correlation between a training signal past through the channel during the training period and a training signal preset by a receiver, and outputs the calculated cross-correlation as the impulse response of the estimated transmission channel.

3. The channel equalizer of claim 1, wherein the channel estimator detects a training period, calculates a cross-correlation between a training signal past through the channel during the training period and a training signal preset by a receiver, multiplies the cross-correlation and an inverse matrix of an auto-correlation matrix of the training signal, and outputs the multiplication result as the impulse response of the estimated transmission channel.

4. The channel equalizer of claim 1, wherein the channel estimator detects a training period, calculates a cross-correlation between a training signal past through the channel during the training period and a training signal preset by a receiver, multiplies the cross-correlation and an inverse matrix of an auto-correlation matrix of the training signal, and outputs an average of the multiplication result and the estimated impulse response of the transmission channel of a previous frame as the

estimated impulse response of the transmission channel of the current frame.

5. The channel equalizer of claim 1, wherein the channel distortion compensator comprises:

a first fast Fourier transform (FFT) unit for converting the received signal from the time domain into the frequency domain;

a second FFT unit for converting the impulse response of the transmission channel estimated by the channel estimator from the time domain into the frequency domain;

a ROM for in advance tabling and storing frequency responses corresponding to an inverse channel of the transmission channel of the frequency domain, and selectively outputting a frequency response corresponding to an inverse channel of the estimated transmission channel, which was outputted from the second FFT unit; and

a frequency domain equalizer for receiving the frequency response of the inverse channel outputted from the ROM, setting the frequency response of the inverse channel as an initial coefficient, receiving a channel equalized signal fed back in data duration, calculating the error between equalized signal and decision value of the same equalized signal, updating the coefficients by using the error between equalized signal and decision value of the same equalized signal continuously,

compensating the distortion of the received signal converted into the frequency domain, and converting the compensated received signal back into the time domain.

6. The channel equalizer of claim 5, wherein the first FFT unit overlaps a received data block whose length is M and a previous data block, and converts the received data block into the frequency domain.

7. The channel equalizer of claim 5, wherein the second FFT unit augments zeros to the impulse response of the estimated channel, whose length is M, so that a size of the augmented impulse response matches a size N of an FFT block, and converts the augmented impulse response into the frequency domain.

8. The channel equalizer of claim 5, wherein the frequency domain equalizer comprises:

a coefficient bank for receiving the frequency response of the inverse channel outputted from the ROM, setting the frequency response of the inverse channel as an initial coefficient for frequency domain equalization, and storing and outputting coefficients that are updated continuously in the data duration;

a first complex multiplier for multiplying the received frequency domain signal outputted from the first FFT unit and a

coefficient outputted from the coefficient bank and compensating the channel distortion contained in the received frequency domain signal;

an IFFT unit for converting the received frequency domain signal, which is outputted from the first complex multiplier and from which distortion was compensated, back into the time domain;

a third FFT unit for receiving an error signal, a difference between an output of the IFFT unit and the signal from which a noise was eliminated by the noise canceller, and converting the error signal into the frequency domain;

a complex conjugate generator for outputting complex conjugate values of the received frequency domain signal outputted from the first FFT unit;

a second complex multiplier for multiplying an output of the third FFT unit and an output of the complex conjugate generator;

a multiplier for multiplying an output of the second complex multiplier and a step size (α); and

an adder for adding an output of the multiplier and a previous coefficient fed back from the coefficient bank thereby updating a coefficient, and outputting the updated coefficient to the coefficient bank.

9. The channel equalizer of claim 8, wherein the frequency response of the inverse channel is inputted to the coefficient bank whenever the training signal is inputted.

10. The channel equalizer of claim 8, wherein the frequency response of the inverse channel is early inputted only once to the coefficient bank, and then channel equalized data is fed back to update the coefficient.

11. The channel equalizer of claim 8, wherein the IFFT unit extracts only rear M samples from N signals converted into the time domain and outputs the extracted rear M samples to the noise canceller.

12. The channel equalizer of claim 8, wherein the third FFT unit augments zeros to a front of the error signal whose length is M so that a size of the augmented error signal matches a size N of an FFT block, and converts the augmented error signal into the frequency domain.

13. The channel equalizer of claim 8, wherein the noise canceller comprises:

a noise predictor for extracting only colored noises from an output of the channel distortion compensator by using the output

of the channel distortion compensator and a decision value of a signal from which an amplified noise is eliminated and which is fed back, and predicting the noise amplified during equalization; and

a first subtracter for subtracting the noise predicted by the noise predictor from the output of the channel distortion compensator, thereby whitening the noise.

14. The channel equalizer of claim 13, wherein the noise canceller further comprises:

a decision unit connected to an output terminal of the noise canceller, for outputting a decision value nearest to a noise canceller output signal that the amplified noise is eliminated;

a multiplexer for selectively feeding back the training signal during a training period and a decision value of the signal that the noise is eliminated during a data period to the noise predictor; and

a second subtracter for outputting as an error signal a difference between a signal outputted through the multiplexer and an output signal of the channel distortion compensator to the third FFT unit of the channel distortion compensator.

15. A channel equalizer for restoring an original signal from a digital television received signal that past through a channel, the channel equalizer comprising:

a channel distortion compensator for converting the received signal into a frequency domain, receiving a channel equalized signal fed back, calculating the error between equalized signal and decision value of the same equalized signal, updating the coefficients by using the error between equalized signal and decision value of the same equalized signal continuously, compensating distortion of the received signal converted into the frequency domain, and converting the compensated received signal back into a time domain; and

a noise canceller for predicting a noise from an output of the channel distortion compensator, the noise being amplified when channel equalization is performed, eliminating the amplified noise contained in the time domain signal outputted from the channel distortion compensator, and feeding the time domain signal back to the channel distortion compensator so as to update a coefficient.

16. The channel equalizer of claim 15, wherein the channel distortion compensator comprises:

a first fast Fourier transform (FFT) unit for converting the received signal from the time domain into the frequency domain;

a coefficient bank for storing and outputting coefficients that are updated continuously in the data duration;

a first complex multiplier for multiplying the received frequency domain signal outputted from the first FFT unit and a the coefficient outputted from the coefficient bank and compensating the channel distortion contained in the received frequency domain signal;

an IFFT unit for converting the received frequency domain signal, which is outputted from the first complex multiplier and from which distortion was compensated, back into the time domain;

a third FFT unit for receiving as an error signal a difference between an output of the IFFT unit and the signal from which a noise was eliminated by the noise canceller, and converting the error signal into the frequency domain;

a complex conjugate generator for outputting complex conjugate values of the received frequency domain signal outputted from the first FFT unit;

a second complex multiplier for multiplying an output of the third FFT unit and an output of the complex conjugate generator;

a multiplier for multiplying an output of the second complex multiplier and a step size (α); and

an adder for adding an output of the multiplier and a previous coefficient fed back from the coefficient bank thereby

updating a coefficient, and outputting the updated coefficient to the coefficient bank.

17. The channel equalizer of claim 16, wherein the first FFT unit overlaps a received data block whose length is M and a previous data block, and converts the received data block into the frequency domain.

18. The channel equalizer of claim 16, wherein the IFFT unit extracts only rear M samples from signals converted into the time domain and outputs the extracted rear M samples to the noise canceller.

19. The channel equalizer of claim 16, wherein the third FFT unit augments zeros to a front of the error signal whose length is M so that the size of the augmented error signal matches the size N of an FFT block, and converts the augmented error signal into the frequency domain.

20. The channel equalizer of claim 15, wherein the noise canceller comprises:

a noise predictor for extracting only colored noise from an output of the channel distortion compensator by using the output of the channel distortion compensator and a decision value of a

signal from which an amplified noise is eliminated and which is fed back, and predicting the noise amplified during the equalization; and

a first subtracter for subtracting the noise predicted by the noise predictor from the output of the output of the channel distortion compensator, thereby whitening the noise.

21. The channel equalizer of claim 20, wherein the noise canceller further comprises:

a decision unit connected to an output terminal of the noise canceller, for outputting a decision value nearest to a signal that the amplified noise is eliminated from the noise canceller;

a multiplexer for selectively feeding back the training signal during a training period and a decision value of the signal that the noise is eliminated during a data period to the noise predictor; and

a second subtracter for outputting as an error signal a difference between a signal outputted through the multiplexer and an output signal of the channel distortion compensator to the third FFT unit of the channel distortion compensator.

22. The channel equalizer of claim 15, further comprising:

a channel estimator positioned at a front of the channel distortion compensator, for estimating an impulse response of a

transmission channel from a received signal having past through the transmission channel, converting the estimated impulse response into the frequency domain, and downloading a reciprocal of the estimated impulse response of the transmission channel in a frequency domain as an initial coefficient of the channel distortion compensator for the equalization in the frequency domain.

23. A channel equalizer for restoring an original signal from a digital television received signal that past through a channel, the channel equalizer comprising:

a channel estimator for estimating an impulse response of a transmission channel from a received signal having past through the transmission channel; and

a channel distortion compensator for converting the received signal and the estimated impulse response of the transmission channel into frequency domain signals, setting a reciprocal of the estimated impulse response of the transmission channel in a frequency domain as an initial coefficient, receiving a channel equalized signal fed back in data duration, calculating the error between equalized signal and decision value of the same equalized signal, updating the coefficients by using the error between equalized signal and decision value of the same equalized signal continuously, compensating distortion of the received signal

converted into the frequency domain, and converting the compensated received signal back into a time domain.

24. The channel equalizer of claim 23, wherein the channel estimator detects a training period, calculates a cross-correlation between a training signal past through the channel during the training period and a training signal preset by a receiver, and outputs the calculated cross-correlation as the estimated impulse response of the transmission channel.

25. The channel equalizer of claim 23, wherein the channel estimator detects a training period, calculates a cross-correlation between a training signal past through the channel during the training period and a training signal preset by a receiver, multiplies the cross-correlation and an inverse matrix of an auto-correlation matrix of the training signal, and outputting the multiplication result as the estimated impulse response of the transmission channel.

26. The channel equalizer of claim 23, wherein the channel estimator detects a training period, calculates a cross-correlation between a training signal past through the channel during the training period and a training signal preset by a receiver, multiplies the cross-correlation and an inverse matrix

of an auto-correlation matrix of the training signal, and outputs an average of the multiplication result and the estimated impulse response of a previous frame of the transmission channel as the estimated impulse response of the transmission channel of the current frame.

27. The channel equalizer of claim 23, wherein the channel distortion compensator comprises:

a first fast Fourier transform (FFT) unit for converting the received signal from the time domain into the frequency domain;

a second FFT unit for converting the impulse response of the transmission channel estimated by the channel estimator from the time domain into the frequency domain;

a ROM for in advance tabling and storing frequency responses corresponding to an inverse channel of the transmission channel of the frequency domain, and selectively outputting a frequency response corresponding to an inverse channel of the estimated transmission channel, which was outputted from the second FFT unit; and

a frequency domain equalizer for receiving the frequency response of the inverse channel outputted from the ROM, setting the frequency response as an initial coefficient, receiving a channel equalized signal fed back in data duration, calculating the error between equalized signal and decision value of the same

equalized signal, updating the coefficients by using the error between equalized signal and decision value of the same equalized signal continuously, compensating the distortion of the received signal converted into the frequency domain, and converting the compensated received signal back into the time domain.

28. The channel equalizer of claim 27, wherein the first FFT unit overlaps a received data block whose length is M and a previous data block, and converts the received data block into the frequency domain.

29. The channel equalizer of claim 27, wherein the second FFT unit augments zeros to the impulse response of the estimated channel, whose length is M, so that a size of the augmented impulse response matches a size N of an FFT block, and converts the augmented impulse response into the frequency domain.

30. The channel equalizer of claim 27, wherein the frequency domain equalizer comprises:

a coefficient bank for receiving the frequency response of the inverse channel outputted from the ROM, setting the frequency response as an initial coefficient for frequency domain equalization, and storing and outputting coefficients that are updated continuously in the data duration;

a first complex multiplier for multiplying the received frequency domain signal outputted from the first FFT unit and a coefficient outputted from the coefficient bank and compensating the channel distortion contained in the received frequency domain signal;

an IFFT unit for converting the received frequency domain signal, which is outputted from the first complex multiplier and from which distortion was compensated, back into the time domain;

a third FFT unit for receiving as an error signal a difference between an output of the IFFT unit and the signal from which a noise was eliminated by the noise canceller, and converting the error signal into the frequency domain;

a complex conjugate generator for outputting complex conjugate values of the received frequency domain signal outputted from the first FFT unit;

a second complex multiplier for multiplying an output of the third FFT unit and an output of the complex conjugate generator;

a multiplier for multiplying an output of the second complex multiplier and a step size (α); and

an adder for adding an output of the multiplier and a previous coefficient fed back from the coefficient bank thereby updating a coefficient, and outputting the updated coefficient to the coefficient bank.

31. The channel equalizer of claim 30, wherein the frequency response of the inverse channel is inputted to the coefficient bank whenever the training signal is inputted.

32. The channel equalizer of claim 30, wherein the frequency response of the inverse channel is early inputted only once to the coefficient bank, and then channel equalized data is fed back to update the coefficient.

33. The channel equalizer of claim 30, wherein the IFFT unit extracts only rear M samples from N signals converted into the time domain and outputs the extracted rear M samples to the noise canceller.

34. The channel equalizer of claim 30, wherein the third FFT unit augments zeros to a front of the error signal whose length is M so that a size of the augmented error signal matches a size N of an FFT block, and converts the augmented error signal into the frequency domain.

35. The channel equalizer of claim 30, further comprises:

a noise canceller for predicting a noise from an output of the channel distortion compensator, the noise being amplified when equalized, and eliminating the amplified noise contained in

the time domain signal outputted from the channel distortion compensator.

36. A digital television receiver comprising:

a demodulator for digitalizing a received signal and demodulating the digitalized signal into a base band signal;

a channel estimator for estimating an impulse response of a transmission channel from an output signal of the demodulator;

a channel distortion compensator for converting the received base band signal and the estimated impulse response of the transmission channel into frequency domain signals, setting a reciprocal of the estimated impulse response of the transmission channel in a frequency domain as an initial coefficient, receiving channel equalized data fed back in data duration, calculating the error between equalized signal and decision value of the same equalized signal, updating the coefficients by using the error between equalized signal and decision value of the same equalized signal continuously, compensating distortion of the received signal converted into the frequency domain, and converting the compensated received signal back into a time domain;

a noise canceller for predicting a noise from an output of the channel distortion compensator, the noise being amplified during equalization, and eliminating the amplified noise

contained in the time domain signal outputted from the channel distortion compensator; and

an error compensator for compensating a phase and an error of data outputted from the noise canceller and outputting the compensated data for channel decoding.

37. The digital television receiver of claim 36, wherein the channel distortion compensator comprises:

a first fast Fourier transform (FFT) unit for converting the received signal from the time domain into the frequency domain;

a second FFT unit for converting the impulse response of the transmission channel estimated by the channel estimator from the time domain into the frequency domain;

a ROM for in advance tabling and storing frequency responses corresponding to an inverse channel of the transmission channel of the frequency domain, and selectively outputting a frequency response corresponding to an inverse channel of the estimated transmission channel, which was outputted from the second FFT unit; and

a frequency domain equalizer for receiving the frequency response of the inverse channel outputted from the ROM, setting the frequency response of the inverse channel as an initial coefficient, receiving a channel equalized data fed back in data duration, calculating the error between equalized signal and

decision value of the same equalized signal, updating the coefficients by using the error between equalized signal and decision value of the same equalized signal continuously, compensating the distortion of the received signal converted into the frequency domain, and converting the compensated received signal back into the time domain.

38. The digital television receiver of claim 37, wherein the frequency domain equalizer comprises:

a coefficient bank for receiving the frequency response of the inverse channel outputted from the ROM, setting the frequency response as an initial coefficient for frequency domain equalization, and storing and outputting coefficients that are updated continuously in the data duration;

a first complex multiplier for multiplying the received frequency domain signal outputted from the first FFT unit and a coefficient outputted from the coefficient bank and compensating the channel distortion contained in the received frequency domain signal;

an IFFT unit for converting the received frequency domain signal, which is outputted from the first complex multiplier and from which distortion was compensated, back into the time domain;

a third FFT unit for receiving as an error signal a difference between an output of the IFFT unit and the signal from

which a noise was eliminated by the noise canceller, and converting the error signal into the frequency domain;

a complex conjugate generator for outputting complex conjugate values of the received frequency domain signal outputted from the first FFT unit;

a second complex multiplier for multiplying an output of the third FFT unit and an output of the complex conjugate generator;

a multiplier for multiplying an output of the second complex multiplier and a step size (α); and

an adder for adding an output of the multiplier and a previous coefficient fed back from the coefficient bank thereby updating a coefficient, and outputting the updated coefficient to the coefficient bank.

39. The digital television receiver of claim 36, wherein the noise canceller comprises:

a noise predictor for extracting only colored noise from an output of the channel distortion compensator by using the output of the channel distortion compensator and a decision value of a signal from which an amplified noise is eliminated and which is fed back, and predicting the noise amplified during equalization; and

a first subtracter for subtracting the noise predicted by the noise predictor from the output of the channel distortion compensator, thereby whitening the noise.

40. The digital television receiver of claim 39, wherein the noise canceller further comprises:

a decision unit connected to an output terminal of the noise canceller, for outputting a decision value nearest to a signal which is outputted from the noise canceller and from which the amplified noise is eliminated;

a multiplexer for feeding the training signal back to the noise predictor in a training period and feeding back the decision value nearest to the signal from which the noise was eliminated to the noise predictor in a data duration; and

a second subtracter for outputting as an error signal a difference between a signal outputted through the multiplexer and an output signal of the channel distortion compensator to the third FFT unit of the channel distortion compensator.